SECTION 711 - MISCELLANEOUS BRIDGE MATERIAL

711.01 Steel Pipe Piles Steel pipe piles shall conform to the requirements of ASTM A252, Grade 2 with either straight or spiral butt-welded seams. Lap welded seams are not acceptable. The steel shall be a Prequalified Base Metal from the AWS D1.1 Structural Welded Code - Steel.

Cast steel points and splices shall conform to the requirements of ASTM A27/A27M Grade 450-240, (Grade 65-35) or ASTM A148/A148M Grade 620-415, (Grade 90-60).

711.02 Gabions Each shipment of gabions to a job site shall be accompanied by a certificate that states that the material conforms to the requirements of this specification. The certificate shall be on manufacturer's letterhead and shall be signed by an officer of the company having legal authority to bind the company.

Mesh openings shall be hexagonal in shape, measuring approximately 75 mm by 100 mm [3 in by 4 in] and shall be uniform in size. Double twist mesh joints shall be flexible with each pair of wires twisted three half turns, commonly called triple twisted, to prevent unraveling. Steel wire and galvanizing shall meet the requirements of ASTM A641M/A641 and ASTM A90, shall have a Class 3 coating, and shall be soft temper. The wire mesh shall have a sufficient elasticity to permit elongation of the mesh equivalent to a minimum of 10% of its length.

a. Galvanized Gabions without Polyvinylchloride Coating The diameter of the steel wire mesh shall be 3 mm [0.1181 in] after galvanizing. The diameter of the selvedge wire, running through all the edges (perimeter wire), shall be 3.899 mm [0.1535 in] after galvanizing. The diameter of the wire for assembling and lacing the gabion units shall be 2.2 mm [0.0866 in] after galvanizing. The above wire sizes shall have a tolerance of +/- 2.5%.

b. Polyvinylchloride (PVC) Coated Gabions When specified on the plans, all galvanized steel wire shall be coated with a minimum of 0.38 mm [0.015 in] of gray or green PVC, which shall be suitable to resist the destructive effects of immersion in acidic, salt, or polluted water, exposure to ultra violet light and abrasion and retain these characteristics after a period of not less than 3,000 hours when tested in

accordance with ASTM G23. The diameter of the steel wire mesh shall be 2.70 mm [0.1063 in] after galvanization and 3.46 mm [0.1363 in] overall, core wire plus PVC coating.

The diameter of the selvedge wire running through all the edges (perimeter wire) shall be 3.399 mm [0.1338 in] after galvanizing and 4.161 mm [0.1638 in] overall, core wire plus PVC coating. The diameter of the wire for assembling and lacing the gabion units shall be 2.2 mm [0.0866 in] after galvanizing and 2.962 mm [0.1166 in] overall, core wire plus PVC coating. All wire sizes shall have a tolerance of +/- 2.5%, the thickness of the PVC excluded.

The mesh shall be capable of withstanding the test described below:

An uncut section of mesh 2 m [6 ft] long and of a minimum width of 1 m [3 ft], including all selvedge bindings, shall have the ends securely clamped for 1 m [3 ft] along the width of the sample. When the width of the section under test exceeds 1 m [3 ft], the clamps shall be placed in the middle portion of the width and the excess width shall be allowed to fall free on each side of the clamped section. The sample shall then be subjected to sufficient tension to cause 10% elongation of the sample section between clamps. After elongation and while clamped as described above (and otherwise unsupported), the section shall be subjected to a load applied to an area of 0.09 m^2 [1 ft^2] located approximately in the center of the sample section between the clamps and in a direction perpendicular to the direction of the tensile force. The sample shall withstand without rupture of any wire or opening of any mesh fastening, an actual load, so applied, equaling or exceeding 2720 kg [6,000 lb]. The ram head used in the test shall be circular with its edges beveled or rounded to prevent cutting the wires.

711.03 Stones for Gabions Stones to fill gabions shall be of clean, hard, and durable rock with a minimum dimension of 100 mm [4 in] in all directions and a maximum dimension of 300 mm [12 in].

Stones to fill hand filled gabions shall be of clean, hard, durable, crushed ledge or quarried rock with a minimum dimension of 100 mm [4 in] in all directions and a maximum of 300 mm [12 in].

711.04 Bridge Drains Bridge drains shall be fabricated in conformance with the details shown in the Contract documents, and to the requirements of Section 504 - Structural

Steel. All bridge drain parts shall be hot-dip galvanized in accordance with the requirements of Section 504 - Structural Steel.

711.05 Protective Coating for Concrete Surfaces The coating shall be a blend of 50% by volume boiled linseed oil and 50% petroleum spirits. The linseed oil shall comply with the requirements of ASTM D260. Petroleum spirits shall meet the requirements of ASTM D235. CAUTION: This blend is flammable.

711.06 Stud Shear Connectors, Anchors and Fasteners Shear connectors shall meet the dimensional tolerances of Figure 7.1 of the ANSI/AASHTO/AWS D1.5 Bridge Welding Code (D1.5 Code). Shear connectors, anchors and fasteners shall meet the material requirements of Section 7 of the D1.5 Code. Shear connectors shall meet the mechanical property requirements of Table 7.1, Type B of the D1.5 Code. Anchors and fasteners shall meet the mechanical property requirements of Table 7.1 of the D1.5 Code, Type A.

711.07 Mattresses Each shipment of mattresses on a job site shall be accompanied by a certificate that states that the material conforms to the requirements of this specification. The certificate shall be on the manufacturer's letterhead and shall be signed by an officer of the company having legal authority to bind the company.

Mesh openings shall be hexagonal in shape, measuring approximately 63 mm by 83 mm [2½ in by 3¼ in] and shall be uniform in size. Double twist mesh joints shall be flexible with each pair of wires twisted three half turns (triple twisted) to prevent unraveling. Steel wire and galvanizing shall meet the requirements of ASTM A641M/A641 and ASTM A90, shall have a Class 3 coating, and shall be soft temper. The wire mesh shall have a sufficient elasticity to permit elongation of the mesh equivalent to a minimum of 10% of its length.

a. Galvanized Mattresses without Polyvinylchloride Coating The diameter of the steel wire mesh shall be 2.2 mm [0.0866 in] after galvanizing. The diameter of the selvedge wire, running through all the edges (perimeter wire), shall be 2.7 mm [0.1063 in] after galvanizing. The diameter of the wire for assembling and lacing the units shall be 2.2 mm [0.0866 in] after galvanizing. The above wire sizes shall have a tolerance of +/- 2.5%.

b. Polyvinylchloride (PVC) Coated Mattresses When specified on the plans, all galvanized steel wire shall be coated with a minimum thickness of 0.38 mm [0.015

in] of gray or green PVC, which shall be suitable to resist the destructive effects of immersion in acidic, salt or polluted water, exposure to ultra violet light and abrasion and retain these characteristics after a period of not less than 3,000 hours when tested in accordance with ASTM G23. The diameter of the steel wire mesh shall be 2.2 mm [0.0866 in] after galvanization and 2.96 mm [0.1166 in] overall minimum, core wire plus PVC Coating.

The diameter of the selvedge wire running through all the edges (perimeter wire) shall be 2.67 mm [0.1050 in] after galvanizing and an overall minimum diameter of 3.43 mm [0.1350 in], core wire plus PVC coating. The diameter of the wire for assembling and lacing the units shall be 2.2 mm [0.0866 in] after galvanizing and 2.96 mm [0.1166 in] nominal overall, core wire plus PVC coating. All wire sizes shall have a tolerance of +/- 2.5%, the thickness of the PVC excluded.

The mesh shall be capable of withstanding the test described below:

An uncut section of mesh 2 m [6 ft] long and a minimum width of 1 m [3 ft], including all selvedge bindings, shall have the ends securely clamped for 1 m [3 ft] along the width of the sample. When the width of the section under test exceeds 1 m [3 ft], the clamps shall be placed in the middle portion of the width and the excess width shall be allowed to fall free on each side of the clamped section. The sample shall then be subjected to sufficient tension to cause 10% elongation of the sample section between clamps. After elongation and while clamped as described above (and otherwise unsupported), the section shall be subjected to a load applied to an area of 0.09 m^2 [1 ft^2] located approximately in the center of the sample section between the clamps and in a direction perpendicular to the direction of the tensile force. The sample shall be able to withstand without rupture of any wire or opening of any mesh fastening, an actual load, so applied, equaling or exceeding 2720 kg [6,000 lb]. The ram head used in test shall be circular with its edges beveled or rounded to prevent cutting the wires.

711.08 Stones for Mattresses Stones to fill mattresses shall be of clean, hard, and durable rock with a minimum dimension of 75 mm [3 in] in all directions and a maximum dimension of 150 mm [6 in].

711.09 Neoprene Pads The neoprene shall be either chloroprene or natural polyisoprene of 50 +/-5 Shore A durometer hardness and shall conform to the requirements of Division 2, Sections 18.2 and 18.3 of AASHTO Standard Specifications for Highway

Bridges, where applicable.

711.10 H-Beam Pile Tips H-beam pile tips shall be cast steel prefabricated pointed H-shaped sections. The slope forming the point shall not be steeper than 1 ¾:1. Material for plain cast steel pile points shall conform to the requirements of ASTM A27/A27M, Grade 450-240 (Grade 65-35). Material conforming to ASTM A148/A148M Grade 620-415 (Grade 90-60) shall be used for pile points equipped with cutting teeth. The use of pile tips fabricated by welding sections of plate in an "H" configuration will not be allowed.

711.11 Elastomer Elastomer for bearings shall be 100% virgin natural rubber (polyisoprene) meeting the physical requirements of Table A, or 100% virgin neoprene (polychloroprene) meeting the physical requirements of Table B. The elastomer compound shall be classified as low-temperature Grade 3. Compounds of nominal hardness between the values shown may be used and the test requirements interpolated. When test specimens are cut from the finished product a 10% variation in “Physical Properties” will be allowed.

Flash tolerance, finish, and appearance shall meet the requirements of the latest edition of the Rubber Handbook as published by the Rubber Manufacturers Association, Inc., RMA F3 and T.063 for molded bearings at RMA F2 for extruded bearings.

TABLE A - REQUIREMENTS FOR NATURAL RUBBER

ASTM STANDARD	PHYSICAL PROPERTIES	50 DURO	60 DURO	70 DURO
D2240	Hardness	50 +/- 5	60 +/- 5	60 +/- 5
D412	Tensile strength, minimum Mpa	15.5	15.5	15.5
	[psi]	[2250]	[2250]	[2250]
	Ultimate elongation, minimum Percent	450	400	300
	HEAT RESISTANCE			
D573	Change in durometer hardness, maximum	+10	+10	+10
70 Hours	Point	-25	-25	-25
@ 70°C	Change in tensile strength, maximum	-25	-25	-25
[158°F]	Percent			
	Change in ultimate elongation, maximum Percent			
	COMPRESSION SET			
D395	22 Hours @ 70°C [158°F], maximum	25	25	25
Method B	Percent			

D1149	OZONE 25 pphm ozone in air by volume, 20% strain 37.7°C +/- 1°C [100°F +/- 2°F] 48 hours Mounting procedure D518, Procedure A	No Cracks	No Cracks	No Cracks
D429, B	ADHESION Bond made during vulcanization kg/m [lb/in]	714 [40]	714 [40]	714 [40]
D746	LOW TEMPERATURE BRITTLENESS Grade 3 - Tested @ -40°C [-40°F] Procedure B	No Failure	No Failure	No Failure
D1043	INSTANTANEOUS THERMAL STIFFENING Grade 3 - Tested @ -40°C [-40°F] Stiffness at test temperature shall not exceed 4 Times the stiffness measured at 23°C [74°F]			
Quad Sheer Test as Described in Annex A	LOW TEMPERATURE CRYSTALLIZATION Grade 3 - 14 days @ -26°C [-15°F]			

Stiffness at test time and temperature shall not exceed 4 times the stiffness measured at 23°C [74°F] with no time delay. The stiffness shall be measured with a quad shear test rig in an enclosed freezer unit. The test specimen shall be taken from a randomly selected bearing. A +/- 25% strain cycle shall be used, and a complete cycle of strain shall be applied with a period of 100 seconds. The first 0.75 cycle of strain shall be discarded and the stiffness shall be determined by the slope of the force deflection curve for the next 0.25 cycle of loading.

TABLE B - REQUIREMENTS FOR NEOPRENE

Shall meet the requirement of Table A - Requirements for Natural Rubber, except for the following:

	HEAT RESISTANCE			
D573 70 Hour @ 100°C [212°F]	Change in durometer hardness, maximum Points Change in tensile strength, maximum Percent Change in ultimate elongation, maximum Percent	+15 -15 -40	+15 -15 -40	+15 -15 -40
	COMPRESSION SET			
D395 Method B	22 Hours @ 100°C [212°F], maximum Percent	35	35	35
	OZONE			
D1149	100 pphm ozone in air by volume, 20% strain 37.7°C +/- 1°C [100°F +/- 2°F], 100 hours Mounting procedure D518, Procedure A	No Cracks	No Cracks	No Cracks

Stiffness at test time and temperature shall not exceed 4 times the stiffness measured at 23°C [74°F] with no time delay. The stiffness shall be measured with a quad shear test rig in an enclosed freezer unit. The test specimen shall be taken from a randomly selected bearing. A +/- 25% strain cycle shall be used, and a complete cycle of strain shall be applied with a period of 100 seconds. The first 0.75 cycle of strain shall be discarded and the stiffness shall be determined by the slope of the force deflection curve for the next 0.25 cycle of loading.

711.12 Stainless Steel Stainless steel shall conform to the requirements of ASTM A167 Type 308 or ASTM A240, Type 304.

711.13 PTFE The PTFE, filled or unfilled, shall conform to the requirements of Section 18.8 of AASHTO, LRFD Bridge Construction Specifications. PTFE resin shall conform to the requirements of ASTM D4894 or D4895.

SECTION 712 - MISCELLANEOUS HIGHWAY MATERIAL

712.02 Calcium Chloride Calcium chloride shall conform to the requirements of AASHTO M144 (ASTM D98).